

Report for the Ministry of Energy and Water Resources

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The Use of Price Indexation in Gas Contracts

Introduction

Having agreed a price for gas (the 'base price'), the parties to a gas contract typically agree that the price will change over time, in accordance with a reference that both parties believe will - for the most part - give them a commercially acceptable price for the volumes of gas bought and sold.

The reference is typically either:

1. A **hub** at which gas is traded - both physically and virtually in 'paper trade' - where a published and **transparent price** for gas is readily and reliably available
2. The prices of some **other fuels** (themselves with reliable published transparent prices) to which the gas can be linked via an **indexation formula**
3. Some other published index of prices - such as consumer price indices, or indices of labour costs in manufacturing.

The vast majority of gas that is traded around the world is priced according to either 1) or 2) above.

This note, prepared for the Ministry of Energy and Water Resources, is intended to help guide the government of Israel in considering the merits of the various forms of indexation, to help identify the most appropriate form of indexation for gas sold from Israel's offshore gas fields to domestic and export markets. The commercial parties to present and future gas transactions will have their own views. IHS considers that the commercial parties will be likely to take into account the same considerations that we examine in this note.

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Basic Principles behind Choice of Indexation

There are two basic principles that guide parties to choose a particular way of indexing the price of gas in a commercial contract:

- The change in gas price, driven by the index, must continue to **reflect the original commercial balance** of value that the parties had agreed. Ideally, the prevailing price will then continue to be at a level that both enables the volume of gas to continue to be sold and used in the final market over the length of the contract and assures a return on the gas producers' investment.
- The reference index must be **outside the control or influence** of each party to the contract

To ensure that these principles are met, long-term contracts also typically contain **renegotiation provisions** which specify that the buyer and seller will negotiate in good faith to restore these conditions, if for any reason the indexation mechanism should fail, in the view of either party, to keep them whole.

The commercial balance of the contract

The choice of oil prices as a reference for gas prices has two main logical drivers:

- For the a company that sells gas to customers who heat their homes, run their factories, or operate their power stations on various oil products - light heating oil, or heavy fuel oil - then a price that stays competitive with the price of those products will ensure that the gas can continue to be sold in the market. This company is prepared to take volume risk, as the price terms help to protect their ability to market the gas.
- For a company that is in the business of producing oil and gas, its shareholders are familiar with valuation based on oil prices and on the oil price risk - indeed holding oil company shares in their portfolio is usually an active choice to take this risk. This company is prepared to take price risk, as his customer is assuring him of the volume offtake.

Where the main customer for a particular gas supply is a power company, or power companies, then the gas supplier and the gas buyer need to take care that the **volume and price risks in the electric power sector** are properly addressed by the terms of the gas contract.

It is unlikely, a priori, that power market risks will be purely linked to oil prices - unless the whole of the rest of the (non-gas) electricity sector depends on oil. This is not clearly the case in Israel's power market.

Outside the control of the parties

The price of oil and oil products are outside the control of any one company, or any one national government. Governments however do sometimes control or set the price of gas that customers in some or all sectors of their national market pay. This can undermine the trust of a seller of gas that any promise he is made when he begins his investment may be broken by the time he comes to sell his gas.

Where there is no market that sets gas prices by the interplay of supply and demand for gas itself, then a seller's only protection against imposition of a price by a regulating government is to find an outside reference. Transparent, internationally-traded oil prices are such a reference.

In some cases, rather than use an international traded price, the price of oil that is actually realised by sales in a particular market is used for reference. Famously, many European gas prices were indexed to the weighted average of light heating oil prices that were delivered in trucks of a specified size (5,000 hectolitres) to five German cities in five different regions - prices that were collected, recorded and published by the Federal German Statistical Office. There was a high level of trust that these published prices would never be manipulated by the German government, and that the ultimate determinants of the prices were the international (Rotterdam) price of oil imported to Germany, and the dollar-local currency exchange rate.

Where there are well-developed traded 'hubs' for gas itself, then the hub price - or an exchange-based price centred on the hub - can also provide assurance to sellers and buyers that no-one can manipulate the price. In this case, there is no risk of intervention from governments. There may however be occasions for suspicion that a large or dominant player may be able to influence prices by the timing of offers of volume for sale, or other means of manipulation.

If a market has enough participants and enough transactions - if it is highly liquid - then such manipulation becomes very unlikely or impossible. The **liquidity** of the market is thus a key consideration for parties who contract to buy and sell gas for a long period of time at a price linked to a hub.

Who uses Oil Indexation, who prices gas from Traded Hubs?

Oil indexation is typically used where there is no local market for traded gas. This is normally the case in 'young' gas markets, in markets where the main sources of supply are long-distance LNG projects, and markets where there is no extensive, 'meshed' pipeline network which can provide lots of choice to customers both in terms of where they bring gas into the system, and, if necessary, where they can take it off.

Where there is a well-developed 'meshed' network, or where there are multiple interconnecting pipelines belonging to different operators, then traded hubs can develop. In the case of a single network, then the public authorities will need to establish a Network Code, under which all market participants will operate. The hub will be Virtual rather than Physical.

- The National Balancing Point (NBP) in Britain, and the Title Transfer Facility (TTF) in the Netherlands are examples of virtual trading hubs where there is a single network operator and a Network Code
- The Henry Hub in the USA is an example of a physical trading hub where multiple pipelines and storage systems interconnect. North America (the United States and Canada) has a large number of physical trading points with hub prices.

The European models

European countries have a mixture of gas contracts where the price of gas is linked to other fuels, subject to price reopener clauses, and hub-related prices. Most of the alternate fuel indexation is to oil products, but in certain cases coal prices form part of the indexation formula. There is a clear evolution in the direction of hub-related prices, as the regulatory environment changes and as confidence grows in the liquidity of hubs.

Older models of indexation in Europe included general price indices - linking the gas price to a measure of general inflation. These were mostly phased out in the 1970s, although some contracts with pure inflation indices survived in Britain until the 1980s.

Refined product indexation

The classical general form of indexation to oil products for Gas Sale and Purchase Agreements is shown in Figure 1 below. Heavy fuel oil and gas oil (light heating oil) are the price references used. The proportion (weighting) of each oil product typically reflects the weight of each sector of consumption (home/office heating on the one hand, heavy industrial use on the other) in the overall market of the company that buys the gas.

Note that a time-lag is built in to the indexation formula, to allow for the gathering of data on oil product pricing.

Figure 1**Gas Sale and Purchase Contracts**

The gas pricing formula in a typical gas sale and purchase contract between a gas producer and a transmission company has the general form:

$$P_n = P_o \left\{ A \frac{(FO)_{T_{n-1}}}{(FO)_o} + B \frac{(GO)_{T_{n-1}}}{(GO)_o} + C \dots \right\}$$

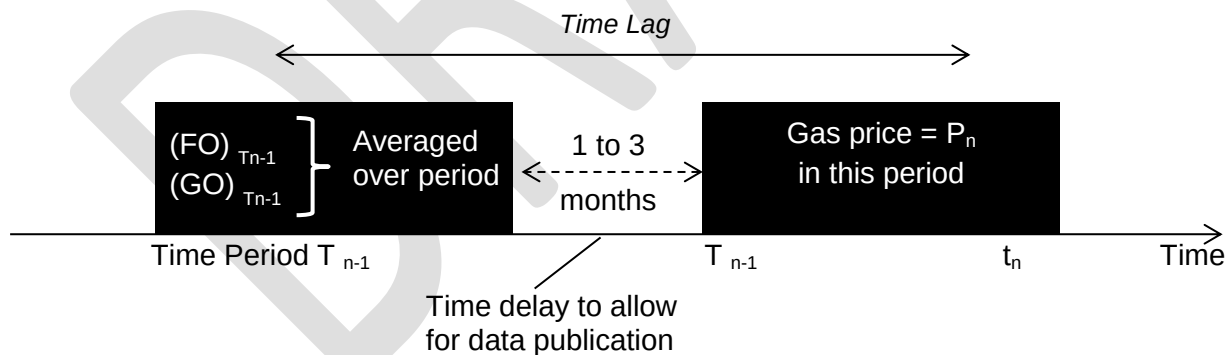
Where P_n = gas price over period t_{n-1} to t_n

P_o = gas price at the time $t = 0$

$(FO)_{T_{n-1}}$ and $(GO)_{T_{n-1}}$ are the prices of fuel oil and gas oil, respectively, at T_{n-1}

$(FO)_o$ and $(GO)_o$ are the prices of fuel oil and gas oil, respectively, at $t = 0$

A, B, C... are constance where **A + B + C +... = 1**



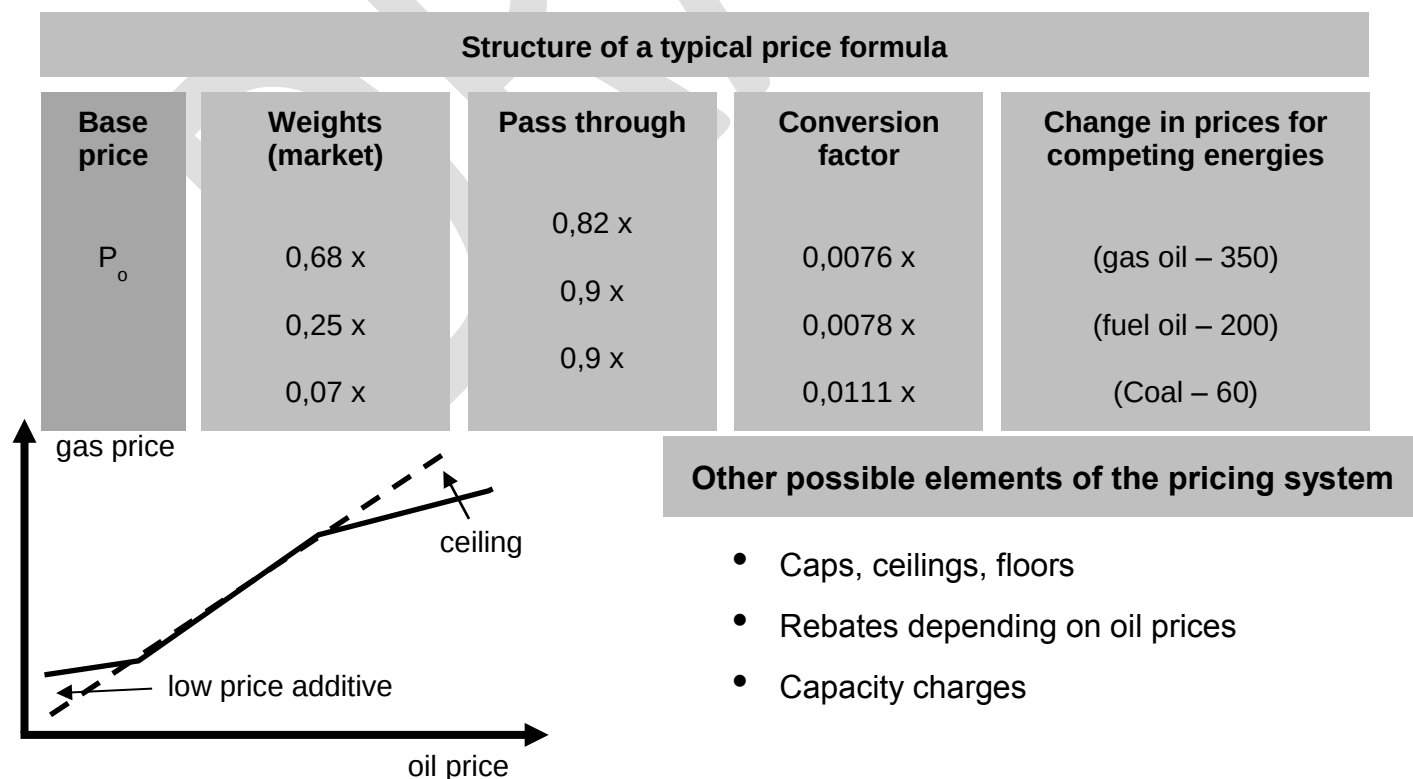
The parties to the contract would agree on the precise figures for the elements of the formula, to match an agreed (or negotiated) understanding of the nature of the markets to be served, and the balance of risks that each party was prepared to undertake. They might agree, for example:

- That some proportion of coal prices should be included in the index
- That the parties would share some of the price risk, by not passing through the full value of changes in oil prices - so as prices rise, the seller gets only some of the benefit, but as they fall, the buyer does not receive the full value of the decline
- The necessary conversion factors from dollar oil prices to local currency units

Figure 2 shows an example of contract indexation that includes these elements:

- 68 percent of the price of the gas will change in proportion to changes in the price of gas oil (light heating oil) - reflecting the fact that about two-thirds of the gas is expected to be marketed to the home and office heating sector
- 25 percent will change in proportion to changes in the price of heavy fuel oil - the industrial market
- 7 percent will change with changes in coal prices - reflecting the (small, in this case) proportion of gas that is expected to be sold to power generators.

Figure 2
Price formula elements – example



Note that the parties have agreed in this case that only 82 percent of gas oil price changes will be passed through, while 90 percent of changes in heavy fuel oil and coal prices will be passed through. This difference in the degree of pass-through reflects the higher share of fixed costs in the home heating sector, which makes customers less sensitive to changes in competing fuel prices in making a decision to switch from one fuel to another.

Figure 2 also mentions other elements that could be brought into the picture - caps and floors, rebates in some extreme circumstances, or capacity charges - depending on the commercial context that the buyer and seller might face.

The key point of Figure 2, in comparison to the general formulation of Figure 1, is to show that the indexation terms of such contracts were tailored to the business conditions of the parties concerned. They especially took account of the nature of the final markets into which the gas was to be sold.

The rise of Traded Hubs—alternative price reference points

Dissatisfaction with oil indexation in Europe arose mainly among industrial customers when gas had come to become a larger share of the fuel supply than oil. The argument that an oil-related price reflected the next best alternative began to weaken. “Why is it that my gas has to be priced at fuel oil equivalent? Why can’t it be the other way round?” is a question that began to be heard in the 1980s in Great Britain, then increasingly in continental Europe in the 1990s and 2000s.

Competition authorities, and especially the European Commission, objected to the foreclosure of capacity rights in pipelines by companies that signed long-term contracts for the capacity that allowed them, and them alone, to hold in reserve the capacity they needed for the maximum daily amount of gas that they had purchased under long-term contracts. The authorities therefore have pressed, over many years, for the development of liquid short-term markets - and transparent prices for gas in those short-term markets - that allow new players in to the business, with access to the commodity (gas) and capacity (in the pipelines). Traders from financial markets, as well as the trading arms of energy companies, have been closely involved in the growth of these markets

This pressure has required the developments of codes and network rules that have taken many years to define and negotiate.

LNG Indexation

Some of Israel's gas will likely be marketed internationally in the form of LNG exports. The price of gas that can be realised in LNG export markets will determine both the resource rent that can be realised by the Israeli state (the fiscal value), and the opportunity value -- in the alternative export markets -- of gas that is sold to domestic customers (the economic value). In the LNG markets in the Pacific region (traditionally Japan, Korea and Taiwan, now also including China, India and other emerging gas import markets) a different set of commercial practices has emerged in the indexation of gas contracts. Once the Leviathan field is developed, Israeli gas is likely to have an opportunity to access these markets. It is desirable therefore for the authorities and the sellers of Israeli gas to develop an understanding of these commercial practices. These are described below.

Indexation clauses used in international LNG contracts follow the same key principles highlighted above, but they have a different formula structure. The archetypal LNG contract is

$$P(\text{LNG}) = x * P(\text{oil}) + y$$

Where

P (LNG) is the price of LNG in \$ per MmBtu

P (oil) is the price of crude oil in \$ per barrel

X is the coefficient or multiple of the oil price

Y is a constant in \$ per MmBtu

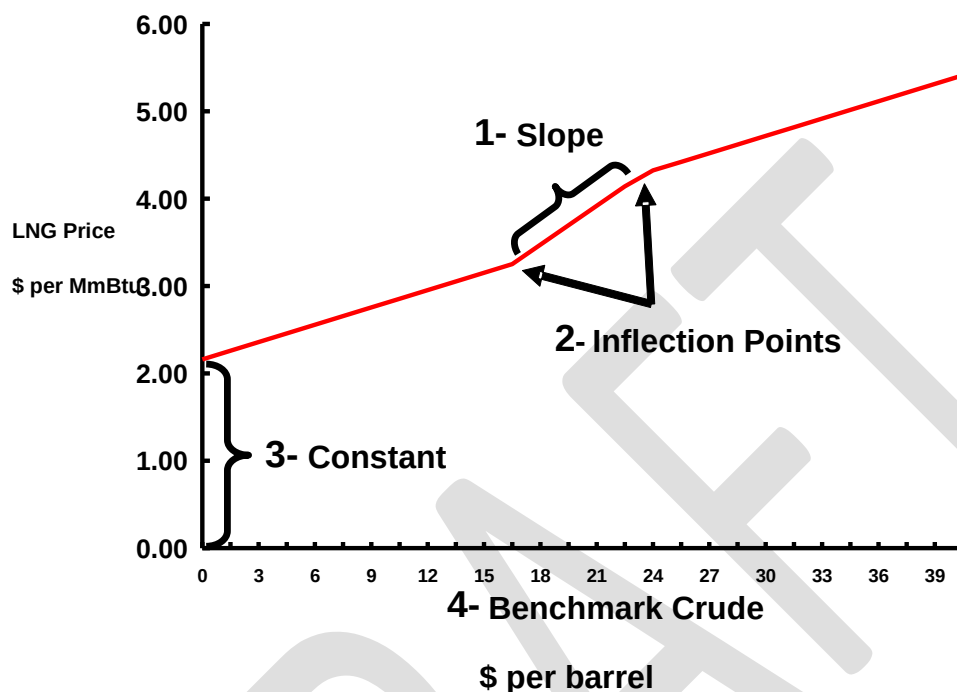
Note that the price of crude oil is used for indexation, and not, as in the earlier pipeline contract examples, refined products. With the important exception of recent contracts signed for LNG out of the United States, the vast majority of Asian long-term LNG contracts continue to include oil indexation of this kind.

There are four key criteria around price that need to be agreed between parties

- The coefficient or 'slope'
- The constant
- The inflection points (known colloquially as kink points)
- The choice of crude reference marker

These are illustrated in Figure 3 'The Four Key Decisions for a Traditional LNG Pricing Formula'

Figure 3



The coefficient

The coefficient is the percentage value of LNG versus oil. A common level for the coefficient has been around 14.5. This means that \$100 oil translates into \$14.50 per MmBtu LNG.

The constant

The constant is usually simply the transportation cost to ship the LNG to the regasification point.

The inflection points

Some LNG contracts include so-called 'S-curves' (known colloquially as kink points) which are designed to protect both parties from a linear exposure to extreme oil price movements, both up and down. This mechanism says that if oil prices reach certain thresholds, the coefficient changes so that the overall price goes up (or down) at a lesser rate than the price of oil. The extreme form of an S-curve is a contract with ceiling and floor prices, also known as caps and collars. These state above a given high oil price and below a given low oil price, the LNG price is fixed. The advantage of a floor price is that it can assure a minimum economic return for an upstream investor.

It might appear that 'S-curves' are designed to protect buyers from high prices and sellers from low prices, but this is only half true. It should be noted that price supports at the low end were originally sought by Japanese *buyers* because they wished to ensure the fundamental economic viability of a

project to ensure that it would proceed. This was considered important on the grounds of security of supply.

The choice of crude marker

Parties need to agree which oil reference price to use. The most common one in Asian trade has been the Japanese Customs Clearing price which is the average price recorded by Japan for its slate of oil imports. Indonesian contacts have often incorporated their own crude reference marker.

The original rationale for the contract structure was that LNG was seeking to substitute for oil in both heating and in power generation in Japan. Japan was actually burning crude oil in power so the use of a crude reference price made good sense as a proxy for the value of LNG in the marketplace. But it should be noted that the formula does not have the sophistication of European pipeline contracts described above where the reference price is broken down between fuel oil and heating oil and given respective weightings in order to mimic as closely as possible the final value of gas in each market.

Over the years, LNG indexation has further moved away from the principle of interfuel netback value. Nowadays the coefficient in oil-indexed contracts is the outcome of a negotiation and reflects the relative market power of either side: in tight markets the coefficient will be higher, and in looser market conditions the coefficient lower.

Hub-based LNG contracts

More recently there has been a shift toward use of hub-based indexation in LNG.

- For sales into northwestern Europe, LNG has become a price-taker. It sells indexed to the gas spot price prevailing in the market of delivery. Markets such as the UK and the Netherlands have developed relatively liquid spot prices and it is not viable for most buyers to contract supplies on any alternative pricing basis which might leave them 'out of the money'.
- The United States is in the process of becoming a major LNG exporter. Buyers of LNG from the US do not buy on an oil indexed basis. Instead their price is normally linked to the spot Henry hub price. Typically the price will be the Henry hub price plus a cost charge to cover pipeline delivery to the liquefaction plant, shrinkage, and liquefaction. This means that the owners of liquefaction are not taking any commodity price risk.

Some buyers hope that Henry hub indexed LNG will yield cheaper LNG supplies. This need not necessarily be the case and the buyer is accepting a price risk which has little or no connection to the value of gas in their end market.

The rise of Henry hub-linked LNG offers the prospect of two very different pricing mechanisms co-existing in the global LNG market. There is no reason why oil-indexed and Henry hub indexed LNG prices will be similar, or even correlated. This has implications for Israel. Those who argue that gas prices need to be somehow linked to an international gas price need to address the question that there is no single global gas price, and there at least two fundamentally different valuation systems in international trade.

Alternatives to Oil and Hub Indexation

It should be noted that other forms of indexation than oil indexation are perfectly possible, and can be more appropriate in some cases, notably where the customers' final markets are not connected in any way with the oil business.

- Fertilizer manufacturers, for example, are sometimes able to negotiate price indexation terms that include an element of the price of ammonia in global commodity markets.
- Electricity companies negotiate 'tolling' arrangements, whereby the price of gas is wholly or partly linked to the price that is realised for electricity. This is usually only possible where electricity itself is sold on a traded market, or where there is a long-term Power Purchase Agreement (PPA) with a buyer who is not himself subject to retroactive price control by a government or regulator.

The independence of the price from influence by one of the parties to the contract, and from the host government of either of the parties, remains a central principle in these cases.

Critical Elements that combine with Indexation to Keep Balance in Long-term Contracts

Most contracts recognise explicitly that indexation may not always and in all circumstances succeed in keeping the commercial balance that the parties originally intended when they agreed the price and delivery terms for the gas in the contract.

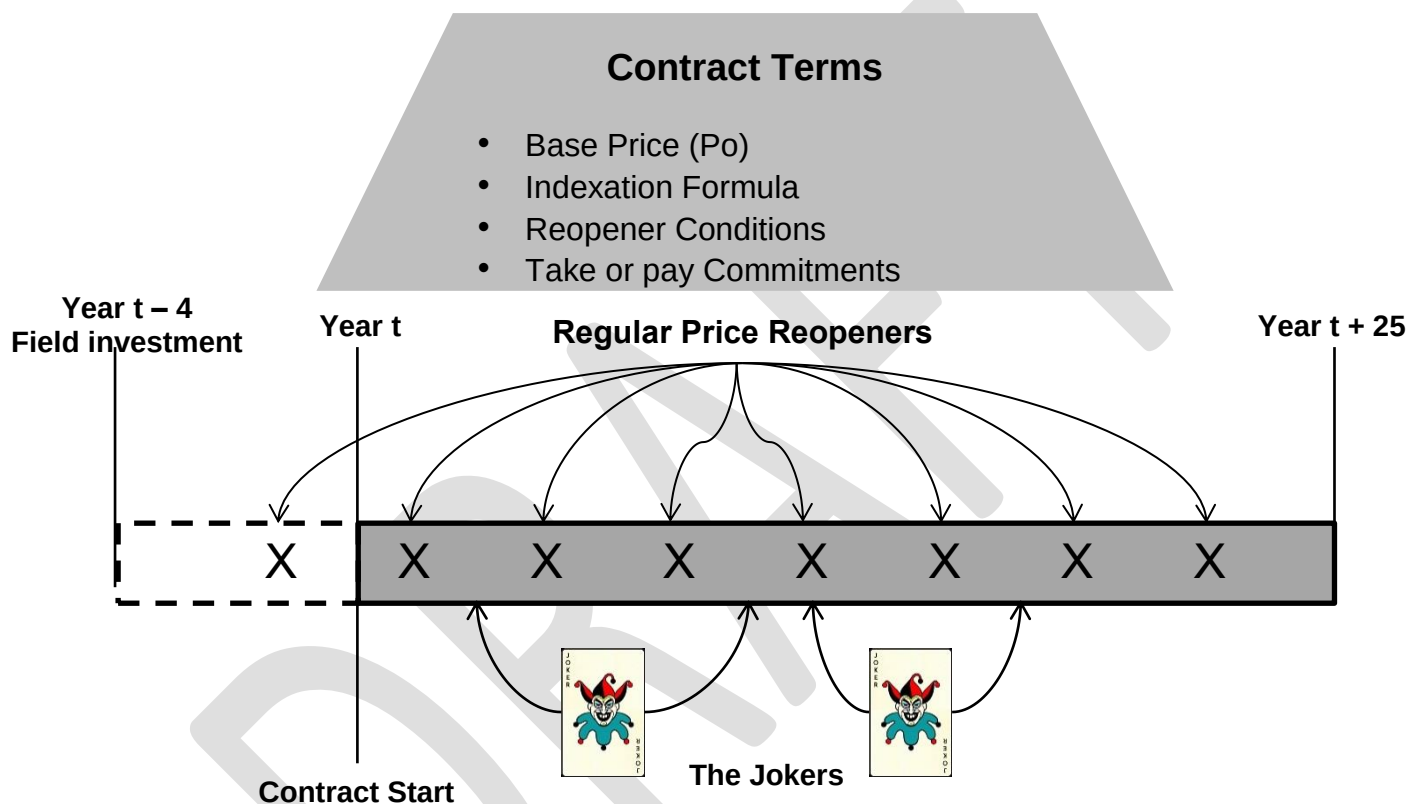
They therefore include other critical elements.

- Price re-openers - **renegotiation provisions** - have already been mentioned. These are fundamental to long-term contracts. Usually there are automatic provisions for reopening price discussions every three years. In addition, each party usually has the right to request exceptional reopening if it feels that circumstances have changed so profoundly that the

commercial balance of the contract has been changed. Each party may have the right to do this - 'to play the joker card' as it is colloquially known - on one or two occasions in each ten-year period of the contract, for example.

Figure 4 summarises the time pattern and key elements that are usually open for re-negotiation under typical price reopened terms

Figure 4
Price Reopeners : The Principles



- But the **circumstances under which either party can claim a renegotiation** are tightly defined in most contracts, and a claim for reopening the price must be carefully justified and reasoned. A typical wording is as follows:

“If the economic circumstances, in the market of the Buyer, which are beyond the control of the Parties, should change significantly compared to what is reflected in the price provisions of the contract, then each Party shall be entitled to an adjustment of the price provisions, reflecting such changes, in particular the value of natural gas in the end-user market of the Buyer, as such value can be obtained by a prudent and efficient marketer of gas.”

If the parties cannot agree on a price within this framework, then the contract will specify terms for arbitration.

- **Take or pay, ‘reliefs’ for take-or-pay, and price variations on those reliefs.** The volume assurance that the buyer typically provides in exchange for the price flexibility which is offered to him by the indexation terms and the re-opener provisions is usually backed by a take or pay commitment. But these can be less onerous than they seem:
 - A buyer usually commits to a Minimum Contract Quantity (MCQ), as well as an Average Contract Quantity (ACQ) on an annual and a daily (or hourly) basis.
 - While the *annual* MCQ may be only 10 percent or 20 percent below the annual ACQ, the *daily* flexibility may be much wider - perhaps 50 percent, or more, depending on the nature of the buyer’s market.
 - There may be a penalty price for failing to lift at even the minimum - but this penalty may be as little as 15 percent of the full contract price.
 - The buyer may ‘roll forward’ gas that he has not taken - and be able to credit money paid under a Take-or-Pay clause against gas that he takes in future years ... even up to five years ahead.

All these, and other elements will typically be negotiated alongside the indexation terms between the seller and buyer of the gas as a function of the nature of the market that the gas is sold into.

In the case of the Israeli power sector, the specific conditions and risks of electricity sales in Israel, including the various risks of priority dispatch for IPPs and IEC respectively should bear strongly on the way in which these elements of a gas contract are negotiated and agreed.

These elements are a fundamental part of the commercial balance of a contract, just as much as the base price will be, and the indexation terms. Robust gas contracts see all these elements

understood by the commercial parties, and negotiated together. The supervising authorities, when they approve any given contract, will be cognisant of these elements as well.

- **Force majeure.** Gas contracts will have a force majeure clause.

Suitability for Israel

The gas market and the gas infrastructure in Israel will not be diverse enough for many years for the creation of traded gas markets around a transparent hub. There are not enough customers, or suppliers, to enable such a market to function around a Network Code.

Some form of external indexation therefore seems desirable.

Factors that will need to be taken into account in identifying suitable indexation are:

- The producers of gas will have export as well as domestic market opportunities
- These export opportunities vary with field/resource size
- The main buyers of gas are exposed to the particular conditions and risks of electricity sales in Israel
- New buyers will emerge over time as the gas network is expanded.

Indexation of gas to oil products, or to external gas markets, may be deeply inappropriate in relation to the business of the electricity producers in Israel, and to the risks and financial exposure that they take.

On the other hand, Indexation of gas against the electricity price, or tolling arrangements, may expose the producers of gas to arbitrary price control, inhibiting their ability to raise finance for field and infrastructure development.

Careful consideration of these risks needs to be undertaken before changes are proposed to the terms of gas contracts, in particular to the indexation terms.

The consideration of these risks should desirably be undertaken while examining the other fundamental aspects of the gas economy, all of which will affect, and be affected by, the indexation and other terms of the gas contract. These include notably the monopoly and semi-monopoly upstream position, the availability and development of storage facilities for load factor balancing, the context of the fiscal regime, and the urgency or otherwise of new field development from the perspective of national and customer interest.

Addendum: Follow-up Questions

1 To what extent is indexation to an international gas hub relevant to Israel?

Indexation to an international hub may have two merits. First, for the gas producer, international hubs may represent the alternative market value of the gas. Hence if Israel wishes to attract international investors, a pricing system that recognises alternative value options may be relevant.

For example, it might be argued that all LNG projects have as a default option the ability to sell into the liquid markets of northwestern Europe. These markets are liquid and **accessible**. There is probably surplus regasification capacity and that capacity can—at least in principle—be accessed via regulated third party access terms. If we accept the proposition that LNG sellers can always access the spot price of northwestern Europe (although that spot price is itself uncertain), then it can be argued that the economic value of Israeli LNG is—at a minimum—the northwest European hub price plus an adjustment for shipping/transportation.

The second merit of an international hub is that it represents a marker outside the control of both parties.

The main drawback to an international hub is that the price may be quite ill-suited to the domestic needs of the Israeli consumer and particularly the needs of the Israeli power sector. A hub price might impose international price movements and volatility that are harmful or difficult for the Israeli power sector to manage. The UK's NBP spot price, for example, tends to be seasonal and reflect the heating requirements of the UK market, of no direct relevance to Israel.

If domestic prices were indexed to an international hub, but some future exports were oil-linked it is possible at times that the domestic price could rise above the export price.(and vice versa).

There is the additional complication of which hub price to choose. There are currently two primary liquid hub areas for gas—North America and Northwestern Europe. These prices are not currently correlated. Indeed within these areas, different hub prices can diverge.

2 There has been discussion about indexing Israeli domestic gas price to the LNG price that BG would achieve if Israeli gas is exported to BG's Egyptian facilities - Is this a reasonable solution?

The logic for this, presumably, is that it provides a direct link with the realizable value of Israeli gas in the international market. As discussed above in this memo, any linkage to international value has theoretical advantages in setting competitive investment signals for international upstream investment, and disadvantages in imposing external prices that may be inappropriate to the needs of the domestic consumers.

In this specific case, there may also be concerns about linking prices to a single deal, or single export project. The gas market is too complex and opaque to assume that a single commercial deal is necessarily representative of international conditions. If the Egyptian LNG seller were to strike an unfavourable deal, Israeli gas would be under-valued. And similarly, if the Egyptian LNG seller were to strike a highly favourable deal, Israeli consumers might be subjected to unnecessarily high prices.

Finally there are practicalities around how to calculate 'netback' value. In order to 'link' the Israeli gas price one would need to subtract the costs of liquefaction, shrinkage, and pipeline transportation. This itself is likely to lead to alternative valuation proposals.

3 To what extent is oil indexation commonly used internationally? (Most Israeli gas contracts are currently indexed to Brent apparently). Is this an optimal solution for Israel?

The use of oil indexation varies by continent.

Oil indexation continues to be the predominant indexation method used in Asian LNG and pipeline contracts. The world's largest individual long-term gas contracts—those between Turkmenistan and China, and Russia and China—are both oil-linked.

Except for the last five years or so, oil indexation was also the predominant pricing mechanism within most of Continental Europe. Over the last few years European contracts have gradually shifted to include more hub indexation, although the amount depends critically on the end market and the supplier. Markets in the northwest have moved more toward hub indexation or spot sales, whereas markets further East or South still retain substantial oil linkage. Supplies from Norway and the Netherlands have been reworked to a hub-based mechanism; while many contracts for supply from Russia and Algeria retain oil indexation.

The world's largest gas market—North America—does not use oil indexation.

It is not possible to comment on the suitability for Israel. However, it is noted in the memo above that young or less mature markets have tended to rely upon oil indexation. More developed and complex markets with a multiplicity of players and an extensive infrastructure have been able to develop self-sustaining hub prices.

4. Can we provide more information on CPI indexation? How common is it internationally? Are there specific examples we can refer to?

We believe inflation indices are relatively rare in international gas contracts. While both sides of a contract may see attractions in an inflation index, CPI is of questionable relevance. CPI will be a

poor proxy for the inflation either of upstream oil and gas costs, or for downstream power generation costs. Over the last ten years, oil and gas costs—as measured by the IHS Upstream Capital Cost Index—have increased far more than regular inflation in most developed economies.

CPI might be more appealing from the market perspective where gas is being sold directly to a large number of residential (and commercial) consumers whose budget is determined by their disposable income. This is not the case in Israel.

5 What is the best mechanism for ensuring that domestic prices are less than export prices (excluding state subsidies)?

As argued above, there may be a case for setting prices within Israel on a basis that takes into account local factors. However, *prima facie*, any pricing system that is based on local conditions risks diverging from the prices determined in international markets, and hence prices could at times rise above export netbacks. Indeed given the volatility of international gas prices, the potential volatility of downstream power markets, and the lack of storage within Israel, the chance that prices diverge at times (in either direction) seems highly plausible. This suggests the idea of an export parity ceiling—but we are not aware of such a system in use internationally. This would require significant extra examination.

6 Take-or-pay. What is the case for insisting on lower take-or-pay thresholds?

Take-or-pay provisions are designed to match the interests of upstream and midstream investors to maximize utilization of their assets with the profile of consumption and the needs of the consumer which are more variable. Take-or-pay clauses are needed for two fundamental reasons:

- The gas supply chain involves predominantly upfront capital costs which need a high level of assurance that the costs can be recouped—otherwise the investments are not forthcoming
- Gas industry development is based on a ‘chain’ from upstream through to consumer in which disruption at any point can imperil either the revenue or supply flow.

Minimum bill ensures a minimum revenue stream for investors. And take-or-pay tolerances allow buyers to meet weather, and other variations in demand. Take-or-pay is one lever of flexibility; another is storage. Where storage is absent or limited—as was the case during the development of the UK market—take-or-pay may have a correspondingly greater value.

It is an economic calculation whether to meet flexibility needs in the upstream—through lower take-or-pay thresholds—or in the downstream through investment in storage (or the offer of interruptible supply contracts/demand-side management).

The greater the take-or-pay tolerance, the lower the utilization of fixed cost assets—whether field infrastructure or pipelines. Hence take-or-pay raises the average unit costs. It may however prove to be lower cost than alternatives such as investment in storage.

We are not initially aware of cases where take-or-pay levels have been held down by regulation in order to ‘protect’ consumers. Such a scheme would appear to increase redundancy in assets, to impose greater costs on investors, together with the added uncertainty on ongoing regulatory risk of changes to the agreed level.

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